

# Technical Barriers to Decarbonization

Large commercial and residential buildings must overcome various hurdles before implementing deep retrofits or capital projects that help achieve building decarbonization. In this section, we address technical barriers and questions often faced by building owners and retrofit project developers.

## Decentralized Systems and Tenant Equipment

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## Infrastructure

### Infrastructure

## Con Edison Steam: assume district steam system will decarbonize

High temperature renewable resources are limited and face hurdles:

- Deep Bore Geothermal
- Renewable Hydrogen
- Carbon Capture and Sequestration
- Biomethane
- Electric Boilers
- High-temperature thermal storage
- High-temperature industrial heat pumps
- Waste Heat Capture and Reuse
- Fission

## Barriers to Electrification:

Utility Capacity Limitations:

- Electric riser capacity
- Switchgear expansion
- New service/vault expansion/point-of-entry space constraints
- Capacity competition with other electrification needs:
  - Space heat and cooling
  - DHW
  - Cooking
  - Pumps and motors

- Excess Distribution Facility Charges (EDF)
- Contributions in Aid of Construction (CIAC)
- Partial Electrification concepts achieve deep decarbonization but do not necessarily achieve peak gas demand reductions (debatable)

Demand reduction strategies do not obviate capacity limitations unless the utility accepts the solution as a permanent demand/load reduction strategy.

- Battery Storage:
  - Fire danger
  - Space constraints
  - Electricity distribution limitations
  - Structural loads
- Building Automation/BMS/Demand Response:
  - Cost
  - Integration limitations; Blackbox software
  - Microgrid development
    1. Cost
    2. Lack of expertise
- On-site Generation:
  - Space constraints
  - Gas use; Zero carbon fuels availability is non-existent
  - Structural loads
  - Pipe infrastructure
- Space constrains
- Structural loads
- Technology limitations:
  - Vacuum insulated storage tanks
  - Phase change material (DHW, space heating)
- Building pipe riser limitations; need additional riser capacity:
  - Building water loops are typically "top down" - cooling capacity is typically located at rooftop mechanical penthouses; cooling towers at roof.
    1. Some exceptions to this rule
  - Space Constraints
- Drilling Difficulty:
  - Outdoor space constraints for geothermal wells
  - Difficult permitting
  - Mud and cuttings disposal
    1. Contaminated soil disposal
  - Overhead clearance constraints for drilling in basements /garages

- Shared Loop/Thermal Utility Limitations:
  - Requires entity that may operate in public ROWs and across property lines
  - Utilities are limited by regulations for gas, steam or electric delivery versus shared loop media (ambient temperature water).
    1. Only utility entities can provide very long amortization periods
    2. Utilities are best suited to work amid crowded underground municipal ROWs.
- Deep Bore Geothermal Limitations:
  - Requires test drilling and geological assessment
  - Seismic risk
  - Drilling equipment is very large - more akin to oil and gas development equipment
  - Subsurface land rights and DEC restrictions
- Lighting with lighting controls
- High-efficiency electrically commutated motors (ECM)
- Variable Frequency Drives (VFD) on pumps and motors
- Retro-commissioning tasks and maintenance
- Staggered work scheduling
- Telework
- Submetering and billing: potentially creates split incentive between landlord and tenant:
  - Water
  - Electric
    1. Onerous regulatory compliance
  - Heat and Cooling
    1. Rent stabilized buildings prohibit billing for heat

## Facade and Windows

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Ventilation

## Ventilation

Heat Pump Limitations

## Heat Pump Limitations

Crossover Device or “Magic Box” Technology

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Multi-purpose technology for heating, cooling, heat exchange and ventilation, filtration, and/or domestic hot water

Zero Carbon Fuels Limitations

## Zero Carbon Fuel Limitations

Low-Carbon Fuels

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Renewable Energy Procurement Limitations

## Renewable Energy Procurement Limitations

Pending Carbon Trading Programs Limitations

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